USDA NRCS Natural Resources Conservation Service

Technology Technical Note No. 1

Procedure for Utilizing a Garmin GPSmap 76 for Field Data Collection in South Dakota

March 2004

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Introduction

This document describes the procedure for utilizing a Garmin GPSmap 76 for field data collection. This document contains information on how to:

- Set up a Garmin GPSmap 76 so that the data collected in the field matches current NRCS GIS layers.
- Setup the Garmin GPSmap 76 for use with the DGPS Beacon Receiver.
- Use the DNR Garmin software to download GPS data into ArcView and upload ArcView data to the GPS for use in the field.

Users should first read the **Garmin GPSmap 76 User Manual** to become familiar with the unit and its features and **Appendix A – Official NRCS Policy in South Dakota for Using GPS to Certify Conservation Practices**. For more information on the DNR Garmin software, refer to the programs help file.

Required Software

In order to use the procedures contained in this document, the following software needs to be obtained and installed:

- ArcView 3.3
- DNR Garmin GPS interface software.
- Customer Service Toolkit

NOTE: The mention and/or use of any software contained in this document should not in any way be considered as an endorsement by USDA-NRCS.

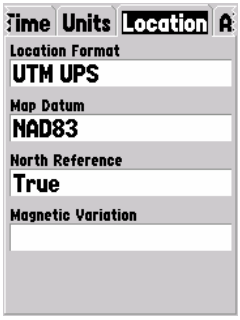
Garmin GPSmap 76 Setup

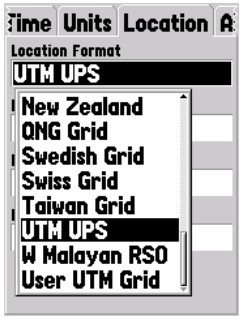
The following procedure should be used to set up a Garmin GPSmap 76 receiver to insure that data collected in the field is consistent with GIS data and imagery currently available to USDA Service Centers. Users should first follow the Garmin GPSmap 76 Owner's Manual and Reference for initial setup and in order to become familiar with the unit and its features.

Position Setup

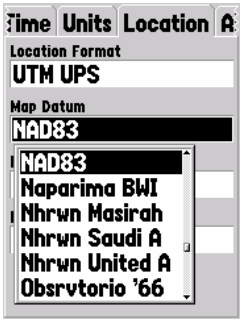
With the Garmin GPSmap 76 turned on, press the menu key twice and select **Setup**.

After selecting **Setup** use the rocker pad to arrow over to **Location**. Press the rocker pad down to highlight the **Location Format** and press the **Enter** key on the unit to bring up the list of formats. Scroll through the list and select either **UTM/UPS** (UTM coordinates), **hddd.ddddd°** (Decimal Degrees), **ddd°mm.mmm** (Degrees Minutes), or **hddd°mm′ss.s** (Degrees Minutes Seconds) and then press the **Enter** key on the unit. (These values can be chosen at the users' discretion and will not affect how the data will be incorporated into ArcView at this time).





After selecting the desired **Location Format**, use the rocker pad to move down to the **Map Datum**. Press the **Enter** key on the unit to bring up the list of formats. Scroll thru the list and select **NAD83**.



Press the **Enter** key on the unit and then press the **Page** key on the unit to return to the map screen on the unit.

When measuring long distances, for a direct reading from the Garmin the following procedure will need to be performed: Go to **"Setup"** in the main menu. Under **"Units"** change "Distance and Speed" to metric. This will allow the direct reading to be in meters, rather than 100ths of a mile.

Convert meters to feet by multiplying meters by **3.28.**

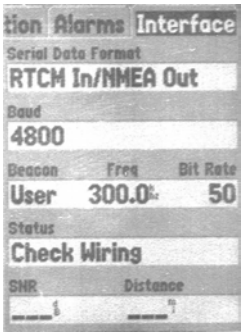
GPSmap76 Setup for Use with the DGPS Beacon Receiver

For NRCS field use in South Dakota, the Garmin GPSmap 76 **must** be used with the DGPS Beacon Receiver. Refer to **Appendix A** for Official NRCS Policy in South Dakota on using GPS to certify conservation practices.

The following items need to be set on the Garmin GPSmap 76 Setup page when the unit is to be attached to the DGPS Receiver:

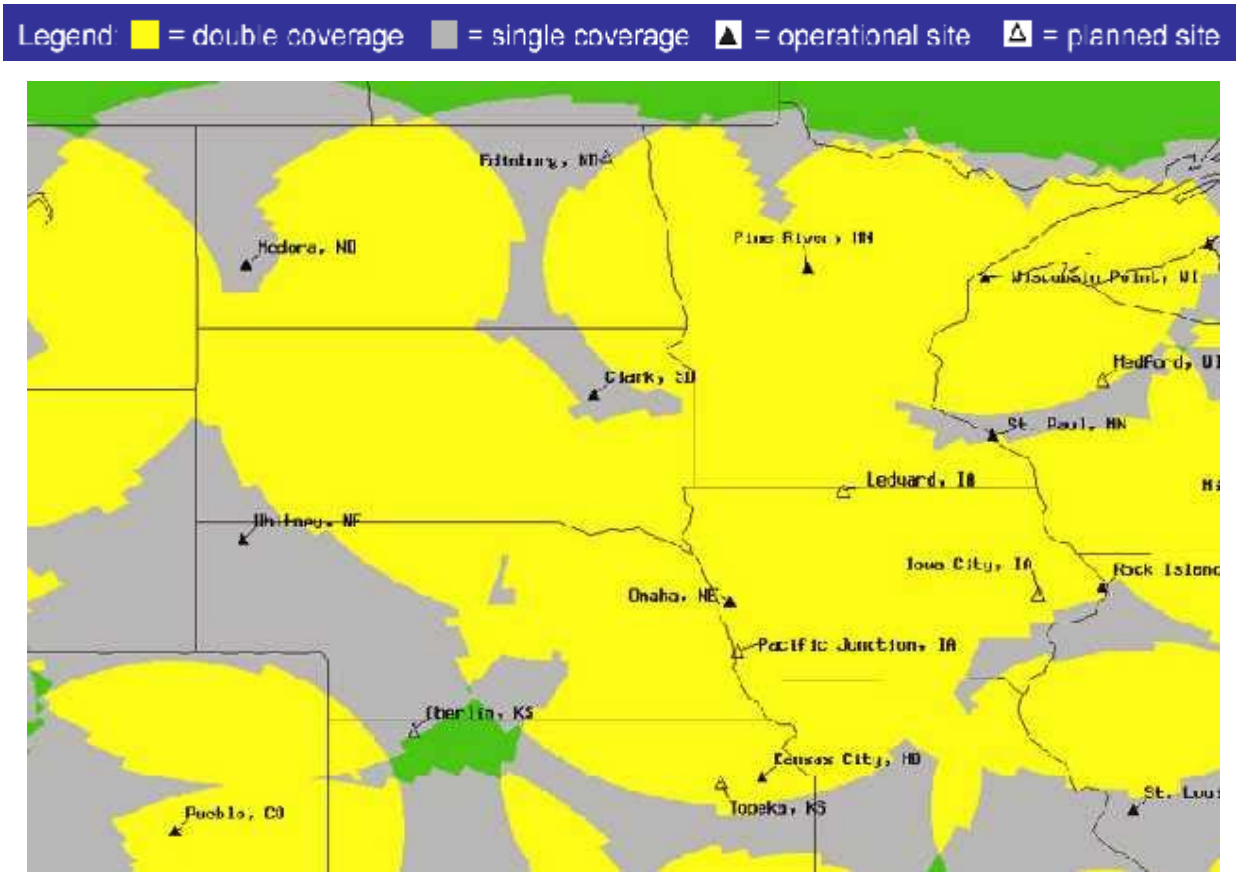
With the Garmin GPSmap 76 turned on, press the menu key twice and select **Setup**.

After selecting **Setup** use the rocker pad to arrow over to **Interface**. Press the rocker pad down to highlight **Serial Data Format** and press the **Enter** key on the unit to bring up the list of formats. Scroll through the list and select **RTCM IN/NMEA OUT** and then press the **Enter** key on the unit. Press the rocker pad down to highlight **Beacon** and press the **Enter** key on the unit to bring up the list of tuning modes. Select **User** from the list and then press the **Enter** key on the unit. Use the rocker pad to arrow over to **Freq** and press the **Enter** key on the unit to change the Beacon frequency to the setting of the Beacon closest to your location and press the **Enter** key on the unit. Use the rocker pad to arrow over to **Bit Rate** and press the **Enter** key on the unit to change the Bit Rate to that of the previously selected Beacon and press the **Enter** key on the unit. In South Dakota, the Clark Beacon has the widest coverage. Refer to the map on the next page to find the DGPS Beacon closest to your location. When a DGPS signal is detected, the **Status** will say receiving and the **SNR** and **Distance** fields will have values in them. The SNR (Signal to Noise Ratio) field should have a readout of 15 or above for quality signal reception.



Refer to the map below to determine the beacon nearest to your location, and the frequency and bit rates. When setting frequency, you need to do each number in the frequency individually. Press the page key to return to the map screen.

Beacon Stations for South Dakota



CLARK, SD
Transmission Frequency: 309 KHZ
Transmission Rate: 100 BPS
Signal Strength: 75 uV/m

MEDORA, ND
Transmission Frequency: 325 KHZ
Transmission Rate: 100 BPS
Signal Strength: 275 KM RADIUS AROUND MEDORA

OMAHA, NE
Transmission Frequency: 298 KHZ
Transmission Rate: 200 BPS
Signal Strength: 100uV/m at 150 SM

WHITNEY, NE
Transmission Frequency: 310 KHZ
Transmission Rate: 100 BPS
Signal Strength: 75uV/m at 280 SM

Procedure for Collecting GPS Data in the Field

Data can be collected in the field as waypoints, tracks or both. It is important to first look at the feature to be measured before deciding which technique to use to collect data. Features which consist of well defined points (i.e. field boundaries, fences, pipelines, etc.,) can, in most cases, be captured more efficiently and accurately as individual waypoints. The more points that are taken, the more accurate the measurement. Points that are not well defined or that are Non-linear (curved) (i.e., treatment areas, wetland boundaries, etc.,) are generally more accurately and efficiently captured using the track function. When the GPS is used for non-linear pipelines and linear features on greater than 15 percent slopes, the track function must be used to accurately capture the item.

Required Accuracy Levels

Accuracy levels need to be maintained in order to collect data as precisely as possible. This level of accuracy will depend on the type of data being collected:

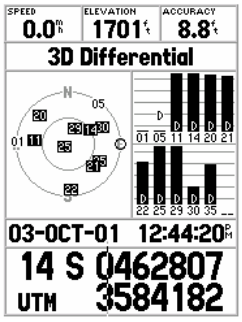
Using GPS to Certify Conservation Practices

When collecting data with GPS for use in certifying conservation practices, every attempt should be made to maximize accuracy. In order to make this possible, it is **required** that the Garmin GPSmap 76 be connected to the DGPS Beacon Receiver. Data collected using DGPS is inherently more accurate and consistent than data collected with autonomous GPS. Refer to **Appendix A - Official NRCS Policy in South Dakota for Using GPS to Certify Conservation Practices.**

The user should only collect data when the following parameters have been met in the field:

The Accuracy which is found on the GPS Information Page should always be **less than or equal to 12 ft. (3.7 meters)**.

If the accuracy level is greater than 12 ft., (3.7 meters), the accuracy may be increased by using the point averaging feature described on page 8.



Collecting GPS Data as Waypoints

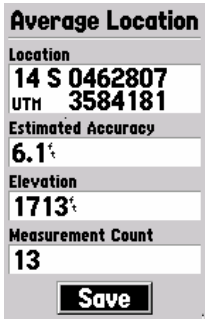
Points that are well defined (i.e., wells, fences, field boundaries, etc.,) can, in most cases, be more accurately and easily obtained by collecting GPS data as Waypoints. Use the following procedure to collect waypoint data:

Place the GPS antenna (either the Beacon antenna when connected to the DGPS Receiver, or the Garmin GPSmap 76 external antenna directly over the point at which data is to be collected (i.e., well head, fence post, etc.)

Press and hold the **Enter/Mark** key. The **Mark Waypoint** page will appear with a default 3 digit number for the new waypoint. The user can either change this number or accept the default. Use the Rocker keypad to arrow down to **OK** and press the **Enter/Mark** button again to accept this value.

Go to the next location and repeat this process.

Positional accuracy can be improved by using the averaging feature in the Garmin GPSmap 76. From the **Mark Waypoint** page, press the **Menu** button on the GPSmap 76 and press the **Enter/Mark** button. The unit will begin to average the position. When you feel that enough measurements have been recorded to get a good average of your position, press the **Enter/Mark** button to save the position and then press the **Enter/Mark** button again to accept this value. For the greatest accuracy, collect 30 to 180 measurements using the average location feature.



Most importantly, keep good notes in the field! Keeping notes of which waypoints go where will make data handling much easier when you get back to the office. See Appendix C for an example of a field GPS Field Note Form.

Collecting GPS Data as Tracks

Points that are not well defined (i.e., wetland boundaries, treatment areas, etc.,) or that are non-linear (curved), as well as linear features on greater than 15 percent slopes are more accurately and easily obtained by collecting GPS data as Tracks. Just before collecting data as Tracks, setup the Garmin GPSmap 76 as follows:

With the Garmin GPSmap 76 turned on, press the **Menu** key twice and select **Tracks** then press the **Enter/Mark** button.

From the **Tracks** Page, press the **Menu** key and select **Setup Track Log** by pressing the **Enter/Mark** button.

From the **Track Log Setup** Page, set the **Recording Mode** to **Stop When Full,** the **Record Method** to **Auto,** and the **Interval** to **Most Often**. Scroll down to **OK** when finished and press the **Enter/Mark** button. Note: The Garmin Map76 will start collecting data as soon as the OK button is pressed. When finished, make sure to turn off the Recording Mode. If this is not done, the GPS will start collecting the data as soon as it is turned on.

When collecting data in track mode it is important to keep the antenna as close as possible to the boundary to be marked. Separate features (i.e., different fields) can be captured using the Track Mode by turning on and off the track record mode at the start and finish of each feature. Tracking can also be turned on/off when obstacles are encountered while collecting data that prevent the user from staying on the intended course. Simply turn tracking off when the obstacle is reached, go around the obstacle and turn tracking back on when you get back on course. Use

DNR Garmin to join different track segments of the same feature (refer to the section **Utilizing DNR Garmin to Download GPS Data into ArcView** for an example).

The Garmin GPSmap 76 has the ability to calculate the area of a single track or multiple tracks that make up the same feature. The GPSmap 76 **does not** have the ability to compute the area from individual waypoints. Follow these steps to compute the area of a Track:

From the **Tracks** Page arrow over to **Save** and press the **Enter/Mark** button. Choices will be to save the entire track log, or to save multiple segments. Choose how far back to save to achieve the proper amount. Make your choice and press the **Enter/Mark** button. After viewing the area calculation of the Track, it is recommended that you arrow over to **Delete** and press the **Enter/Mark** button to remove this saved track from the GPS. The original track will remain stored in the GPS internal memory as part of the active track log.

IMPORTANT: In the process of saving a track, the GPS filters the track data. Be aware that the area calculated may vary somewhat from the area calculation you will get in ArcView from the unfiltered (original) track data. This variation will depend on how complex the original track data is. **Remember for conservation practices, the official NRCS policy is to calculate areas measured with a GPS in ArcView/Customer Service Toolkit before certifying it.**

Again, keep good notes in the field! Keeping notes of which track segments go where will make data handling much easier when you get back to the office. See Appendix C for an example of a GPS Field Note Form.

Utilizing DNR Garmin to Download GPS Data into ArcView

IMPORTANT: The Garmin GPSmap 76 interface setup **MUST** always be returned to the **Garmin** format before attempting to download to ArcView using DNR Garmin.

To Change the interface Setup: With the Garmin GPSmap 76 turned on, press the menu key twice to go to the main menu and select **Setup**. After selecting **Setup** use the rocker pad to arrow over to **Interface**. Press the rocker pad down to highlight **Serial Data Format** and press the **Enter** key on the unit to bring up the list of formats. Scroll through the list and select **GARMIN** and then press the **Enter** key on the unit.

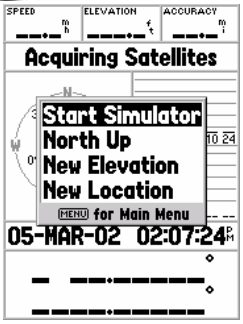
DNR Garmin (© 2001 Minnesota Dept. of Natural Resources) is a combination Visual Basic program and ArcView extension that communicates with the GPS receiver and converts the information received into shapefiles or graphics for use in ArcView. Refer to the DNR Garmin help file for more information.

Connect GPS to the Computer

Use the Serial port cable that was supplied with the GPS to **connect it to the computer**.

Turn on the GPS.

From the **GPS Information** page, press the **Menu** key and select **Start Simulator**.



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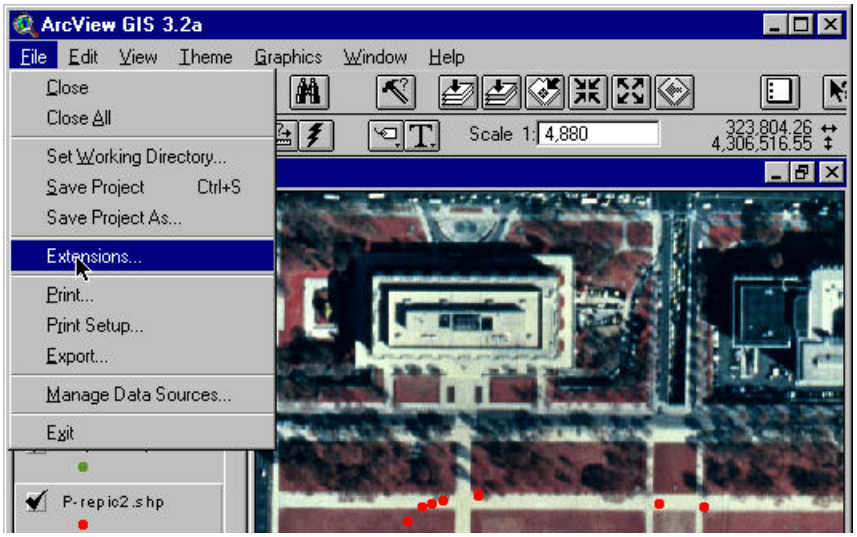
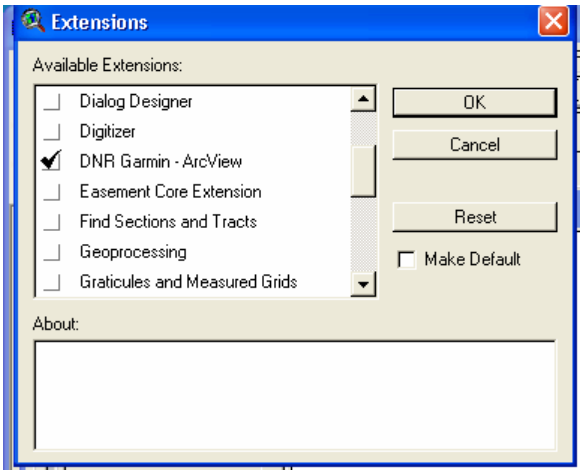
Load the DNR Garmin Extension in ArcView

In ArcView, go to the menu and select **File > Extensions** to open the extension dialog box.

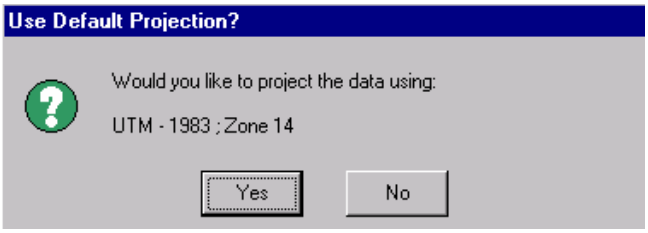


Choose the **DNR Garmin – ArcView** extension by **selecting the check box** next to its name on the list shown in the dialog box.

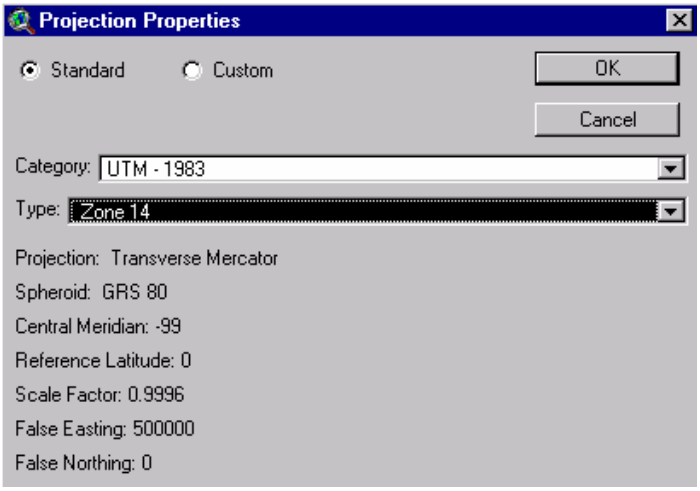
Click **OK**. A new menu called DNR Garmin will be added to the screen menu in ArcView.



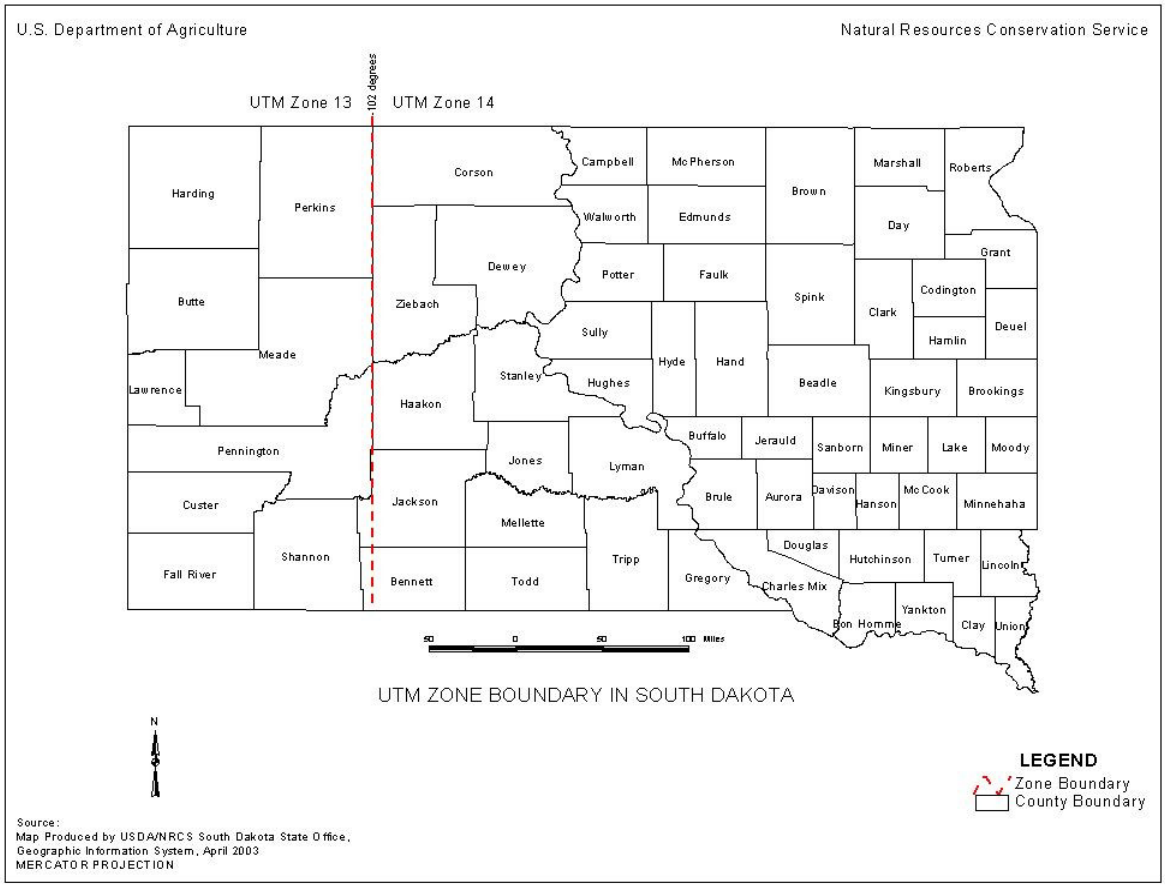
When you run the DNR Garmin extension for the first time, the program will ask you to set the default projection. From **the Use Default Projection** dialog box, select **No**.



From the **Projection Properties** dialog box, select **UTM –1983** from the **Category** list. Select the appropriate **UTM Zone** from the **Type** list that matches the projection of your county's mosaic DOQ. When finished setting the Projection Properties, click **OK**.



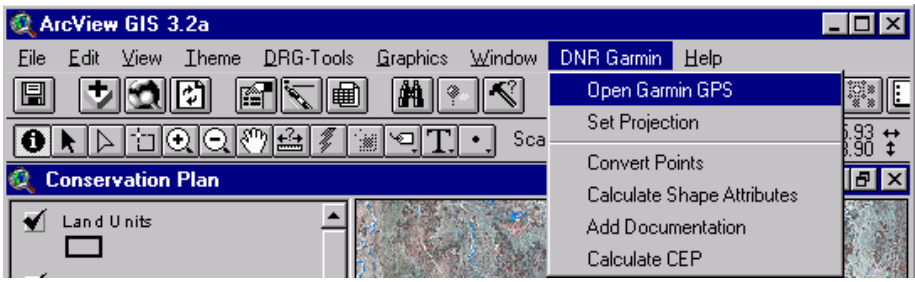
Refer to the following map to determine which UTM Zone your county is in.



Run the DNR Garmin Extension

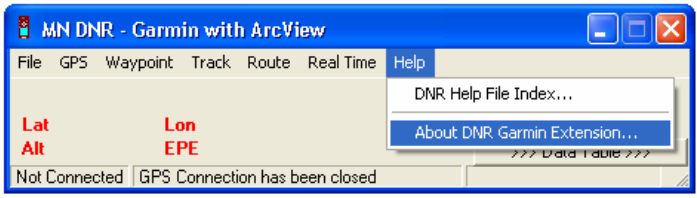
Check the projection by selecting the Set Projection menu item.

Select **Open Garmin GPS** from the **DNR Garmin** menu item in ArcView.

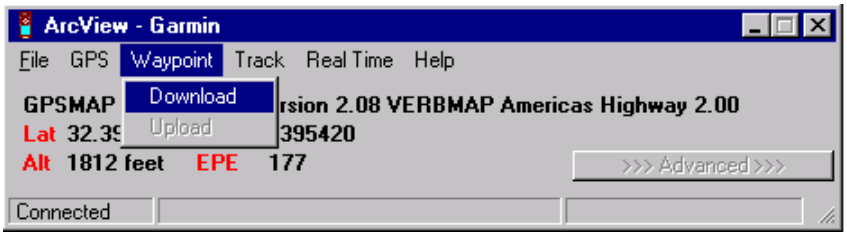


Note: The DNR Garmin functions and windows described are for DNR Garmin Version 4.0. Earlier versions may not have all described features.

To check the version: After opening Garmin GPS, Select “Help”, then Select “About DNR Garmin Extension.” The version number of the MN-DNR Garmin extension in use will be shown.



Select **Waypoints>Download** to download waypoints or **Track>Download** to download tracks from the GPS.

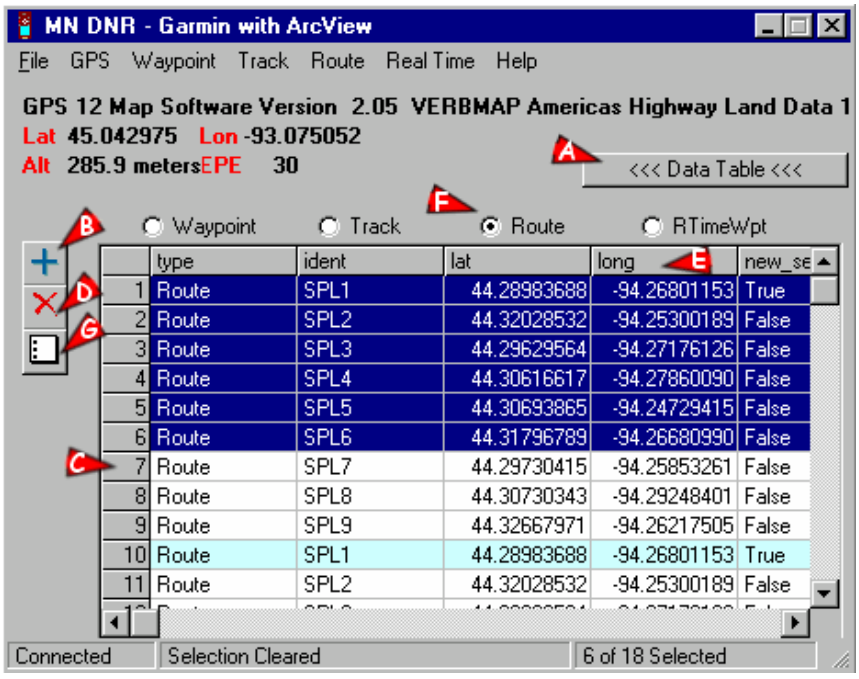


The program will begin retrieving all waypoints or tracks stored in the GPS memory.

When all records have been retrieved, a dialog box will appear that tells how many records have been received. Click **OK** to close this dialog box.

Editing GPS Data

The Data Table can be used as a tool to manage waypoints, tracks, routes, and real-time data. Depending on the Version of DNR you have, to open the table, click on the **>>> Data Table>>>** or the **>>>Advanced>>>** button **(A)**. There are several fields that tell you about the information **(E)**. The TYPE field indicates the type of point this represents. Lat and Long show the coordinates of the point in decimal degrees. Two fields, IDENT and COMMENT, are used to identify and name the waypoint (Tracks only have IDENT).



Editing Table Information

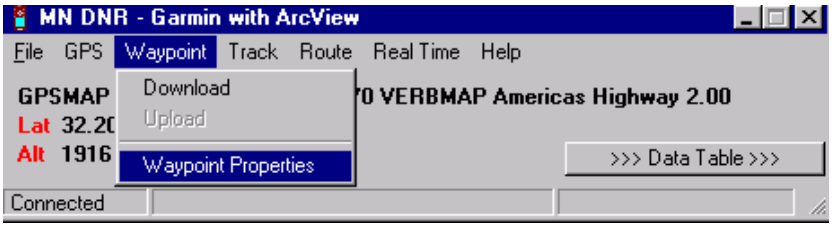
Double-clicking on a cell will bring up a dialog that allows you to change the values of the data. Multiple cell values can be edited at once if you select multiple cells then hold the shift key down while double-clicking on the selected cells. The value you type in will be applied to all selected cells.

Adding Records
Blank records can be added to the table by clicking on the Add Record button **(B)**.

Deleting Records
To delete a record select a row **(C)** (whole rows will highlight if you click in the left-most column). To select multiple rows hold down the mouse and drag. To delete these records press the Delete **(D)** button.

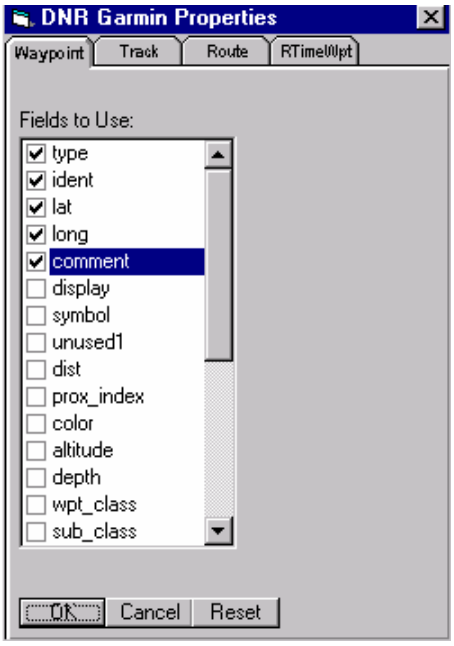
Deleting Columns
To delete columns from your waypoint or track table select a column **(E)** (whole columns will highlight if you click in the top-most row). To select multiple columns hold down the mouse and drag. Once you've got the columns selected, press the Delete **(D)** button.

Setting Default Columns
When downloading data from the Garmin, many fields with no value get created for each record. To customize the visible fields go to the **Properties** menu item under each of the following menus: Waypoint, Track, Route, or Real-Time. Uncheck the fields you do not want to see and click **OK**. The next download of data will only have the fields that are checked.

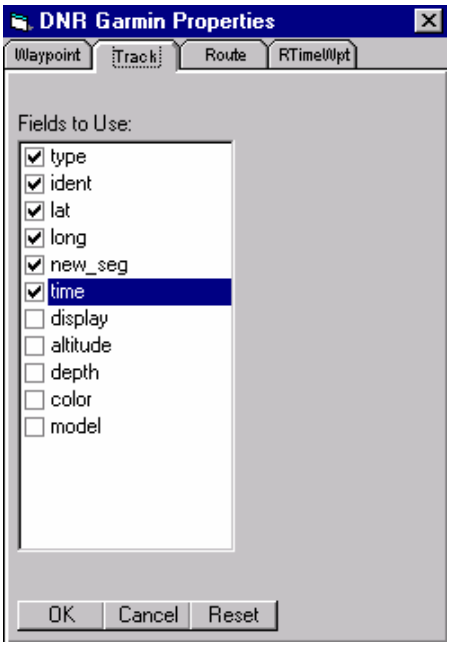


Refer to the following Dialog boxes below for the suggested fields to be left checked.

Waypoint Fields



Track Fields



Converting Data

Convert from one data type to another data type by clicking on the appropriate radio dial across the top of the table **(F)**. This is most useful when data was collected as waypoints and a change is needed to polygons or lines from the waypoint data.

Saving Data

When you save your data, only those records that are selected are saved to a shapefile, graphic or text file. If you have no records selected then all records will be converted. To clear the selection, press the Clear Selection button **(G)**.

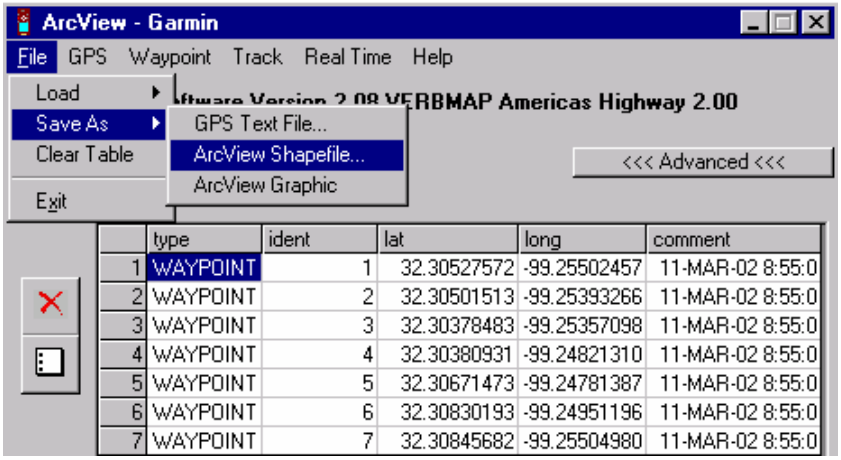
Working with Waypoint Data Using DNR Garmin

Once you have successfully downloaded the data from the GPS, it can be edited and imported into ArcView as either a point shapefile or as graphic points. DNR Garmin also gives the user the capability to save the GPS data as a text file for later reference.

Saving the Waypoints as an ArcView shapefile

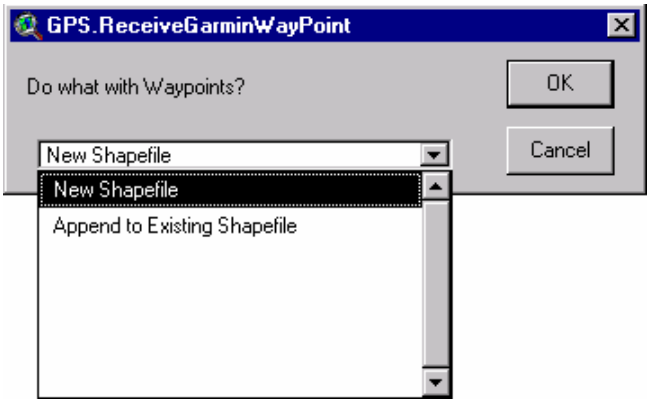
After editing the waypoint data, save the data as a new ArcView shapefile or append the waypoint data to an existing point theme already in ArcView.

Select **File> Save As> ArcView Shapefile**

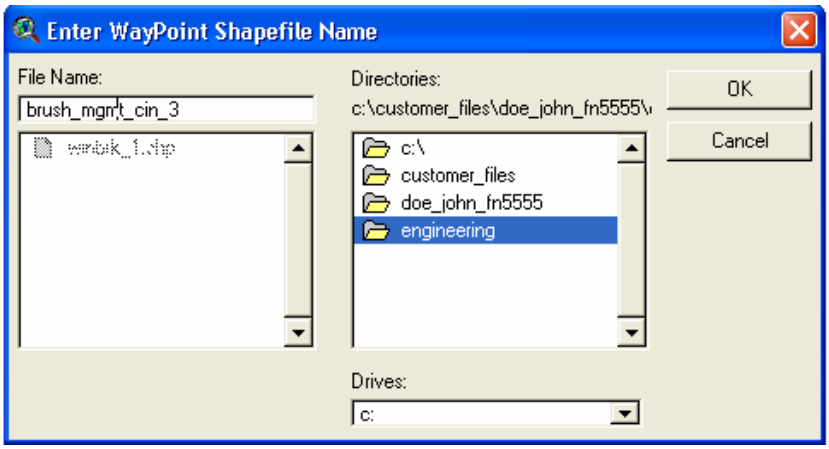


Select either **New Shapefile** or **Append to Existing Shapefile** and click **OK**.

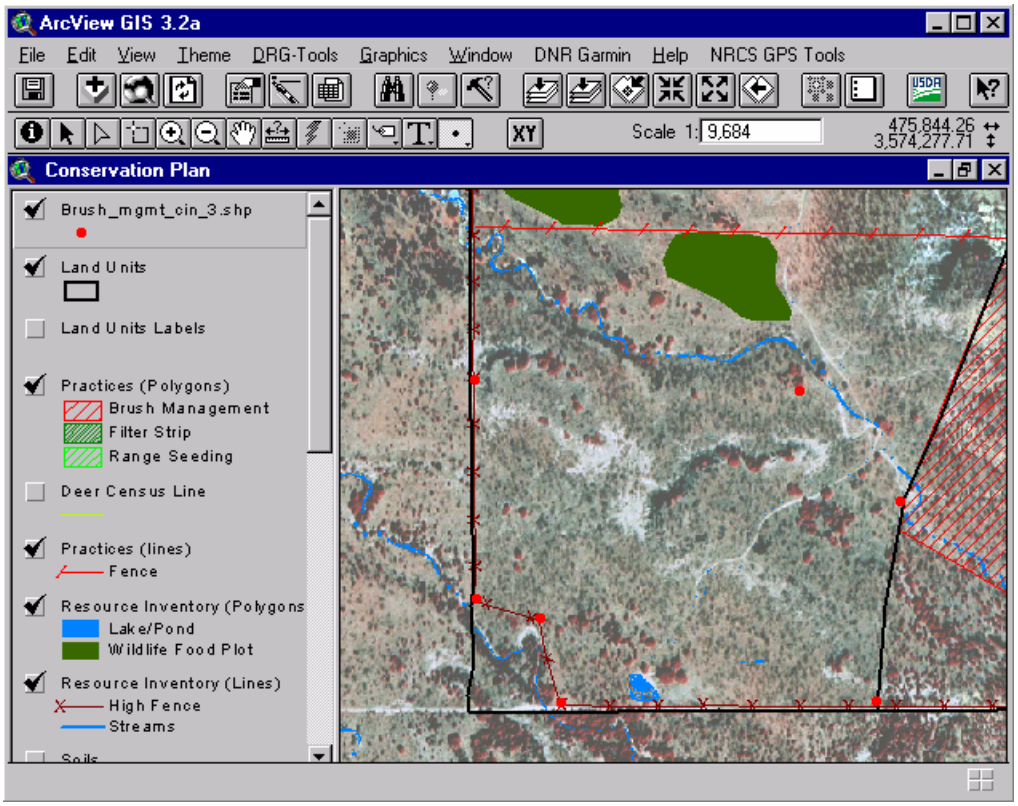
(**Note:** when appending waypoint data to an existing theme, you can only append to a point theme.)



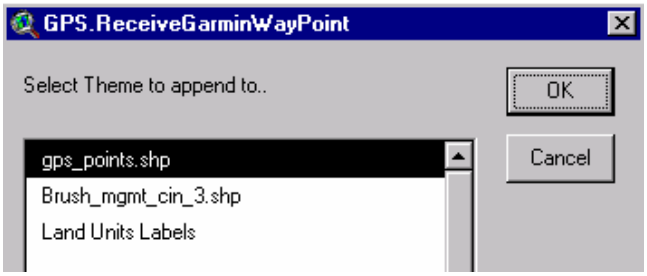
If creating **a New Shapefile**, navigate to the drive and directory (normally this would be c:\customer_files\ < your customers file>\) where you would like to store the new shapefile, give it a descriptive **File Name** and click **OK**. Do not have any empty spaces in the file name.



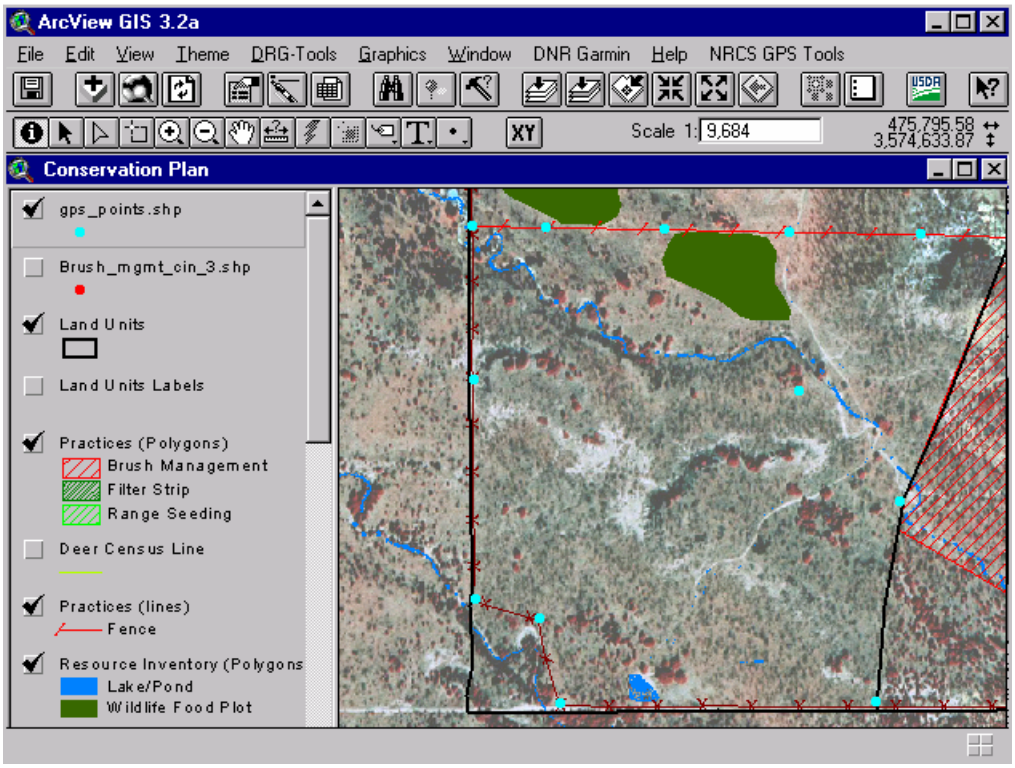
The new theme is added to the View in ArcView.



If **Append to Existing Theme is chosen**, select which point theme from the list you would like to append the waypoint data to and click **OK**.

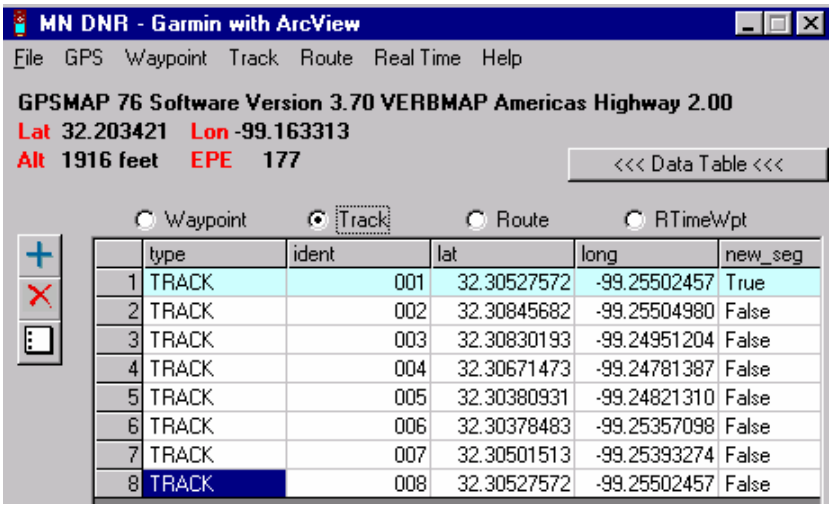


The waypoints will then be appended to the points already within the ArcView theme.



Using DNR Garmin to Convert Waypoints to Lines or Polygons

It is sometimes more efficient to collect GPS data as waypoints and then convert those points to lines or polygons using DNR Garmin. DNR Garmin easily converts data from one type to another. In order to make lines or polygons out of waypoints, click on the radio button next to Track to change the point type from Waypoint to Track. Refer to the next section on working with and saving Track data using DNR Garmin.



	type	ident	lat	long	new_seg
1	TRACK	001	32.30527572	-99.25502457	True
2	TRACK	002	32.30845682	-99.25504980	False
3	TRACK	003	32.30830193	-99.24951204	False
4	TRACK	004	32.30671473	-99.24781387	False
5	TRACK	005	32.30380931	-99.24821310	False
6	TRACK	006	32.30378483	-99.25357098	False
7	TRACK	007	32.30501513	-99.25393274	False
8	TRACK	008	32.30527572	-99.25502457	False

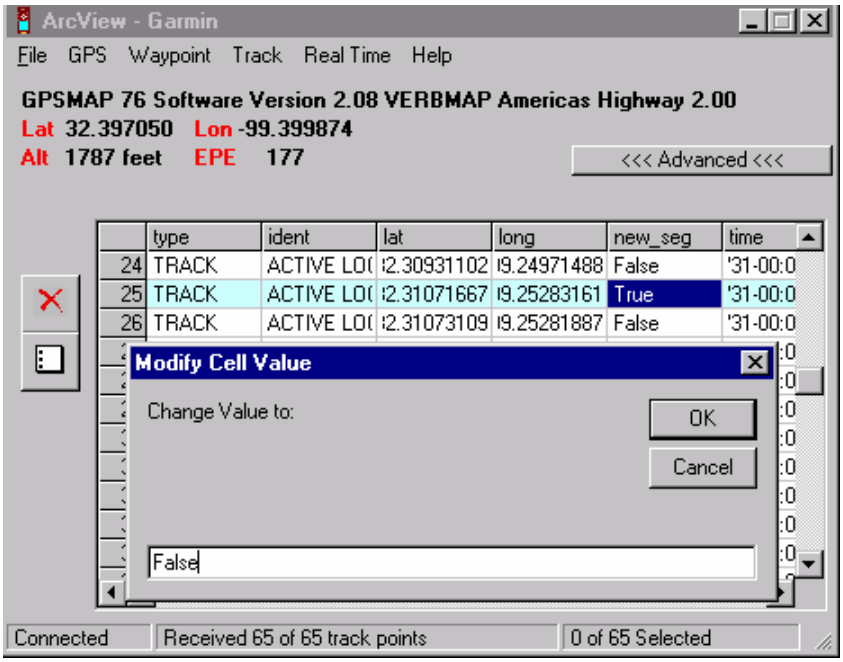
Working with Track Data Using DNR Garmin

After the tracks are downloaded, editing the data can occur and the data can be imported into ArcView as a point, line, or polygon shapefile or as graphic points, lines or polygons. DNR Garmin also gives the user the capability to save the GPS data as a text file for later reference.

Editing the Track Data

Before saving the GPS data, it is useful to edit the data to remove unwanted information. Any unwanted track points should be removed before saving the data.

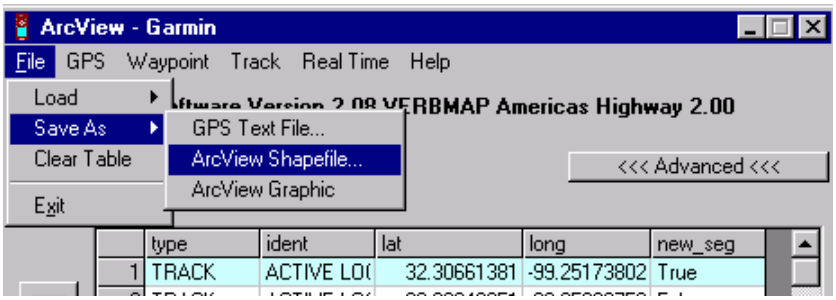
If multiple tracks make up the same polygon, merge these tracks together before saving. In the DNR Table, the start of each track is highlighted in blue. To merge two or more tracks, double click on the cell in the **new_seg** column which corresponds to the track needs to merge with the previous track. Change the value from **True** to **False**.



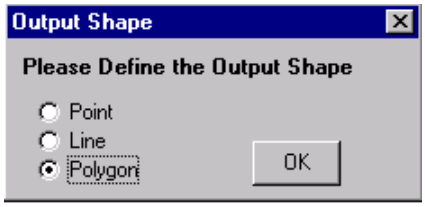
Saving the Tracks as an ArcView shapefile

After editing the track data, save the data as a new ArcView shapefile (point, line or polygon) or append the track data to an existing theme already in ArcView.

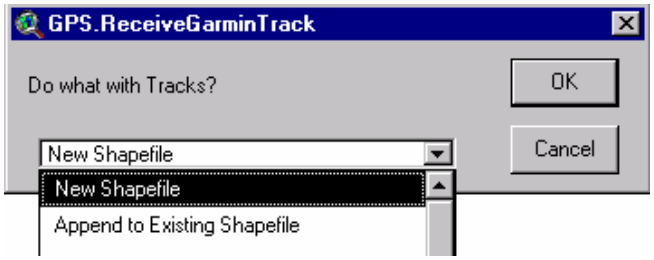
Select **File> Save As> ArcView Shapefile**



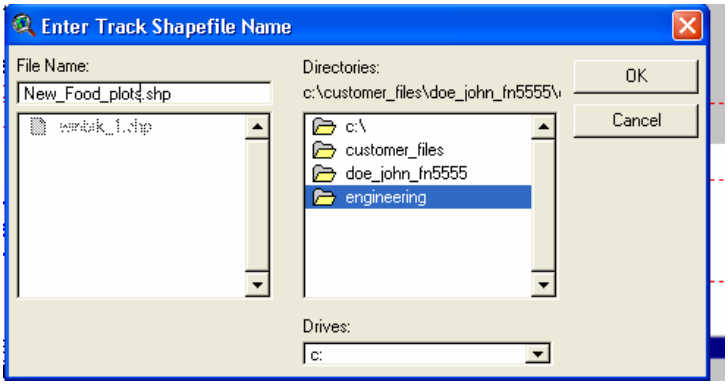
Select the output type for the data. Click **OK.**



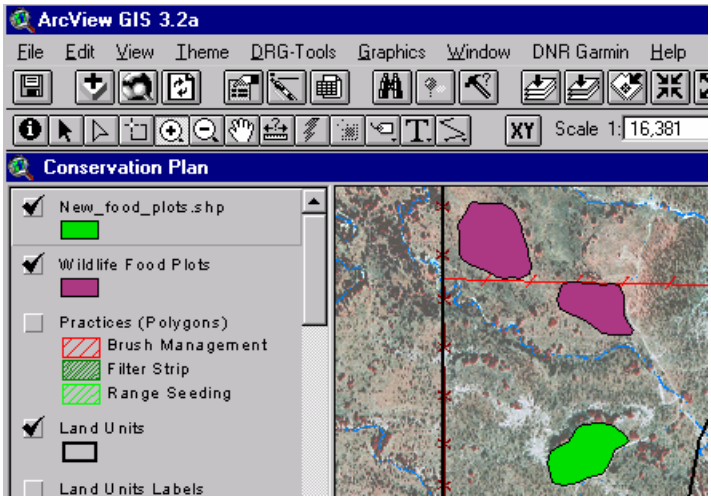
Select either **New Shapefile** or **Append to Existing Shapefile** and click **OK**.



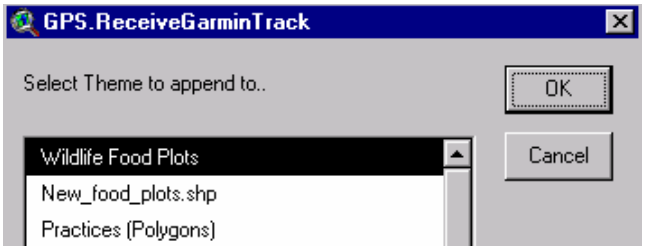
If creating **a New Shapefile**, navigate to the drive and directory where you would like to store the new shapefile (normally this would be c:\customer_files\ < your customers file>\), give it a descriptive **File Name** and click **OK.**



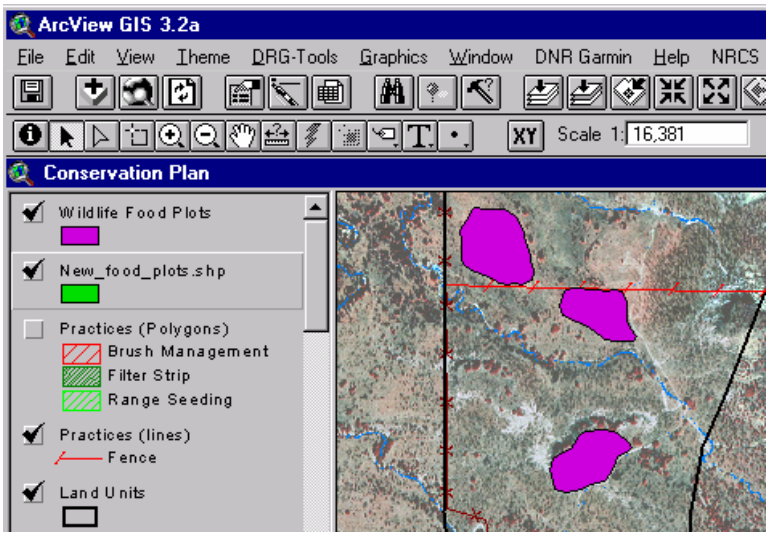
The new theme is added to the View in ArcView. Each individual track that came from DNR will be a separate polygon or line feature within the theme.



If **Appending to Existing Theme**, select which theme from the list you would like to append the track data to and click **OK**.



The tracks will then be appended to the points, polygons or lines (depending on the type of theme) already within the theme in ArcView that it is being appended to.

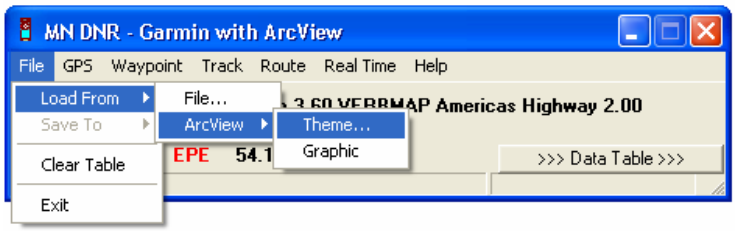


Uploading ArcView Data to the GPS Using DNR Garmin

DNR Garmin has the capability to upload position data from ArcView shapefiles to the GPS. This can be very useful for locating features such as well heads, wetland boundaries, etc, or for laying out conservation practices such as fences, brush management, tree shelterbelts or grass plantings.

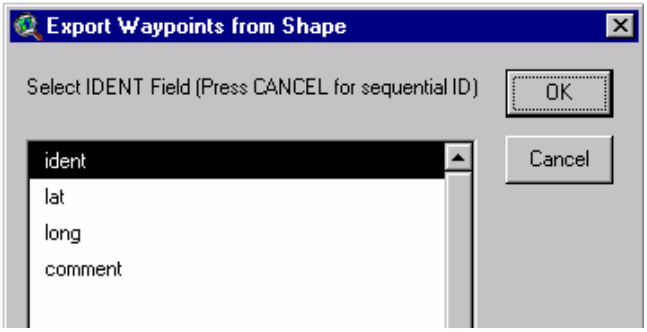
Uploading Waypoints

Waypoints can be loaded into the GPS from point shapefiles or graphics in the active view. In order to upload waypoints from shapefiles, the shapefile must be active. DNR Garmin will only upload the selected features of the shapefile. If there are no selected points in the shape, all points will be uploaded. Only selected graphics will be uploaded.

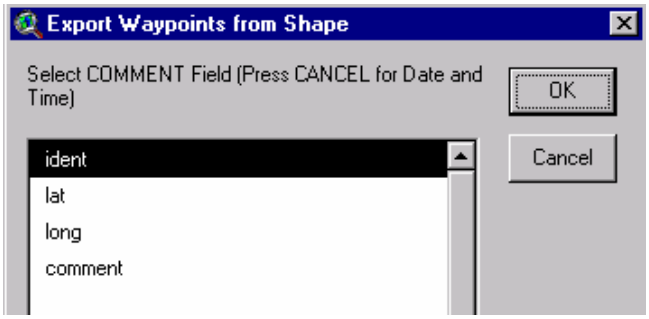


Click on **File>Load From>ArcView>** and choose **Theme**, or **Graphic** to begin uploading waypoint data into the DNR Garmin table from ArcView.

If loading data from a shapefile, DNR Garmin will open a dialog box asking what value from the shape attribute table to use for the ident field to be loaded into the GPS as the Waypoint number. Select one and hit **OK** or press **Cancel**. Pressing the Cancel button will number each point sequentially starting at 1.



A second dialog box will open asking what value from the shape attribute table is to be used for the comment field to be loaded into the GPS as the Waypoint description. Select one and hit **OK** or press **Cancel**. Pressing the Cancel button will assign the current date/time to each waypoint.

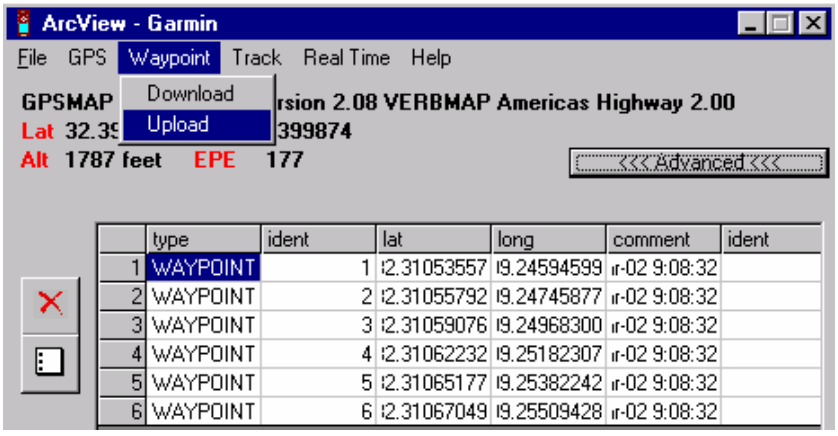


If loading graphics as waypoints they will automatically be assigned sequential idents and the comment field will default to the current date/time, since graphics do not have attributes.

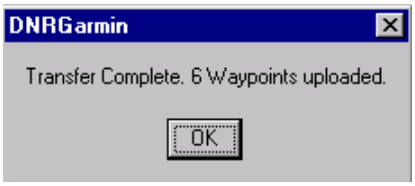
Caution! The program will overwrite any waypoints on the GPS unit that have the same ident as a waypoint being uploaded!!

The Waypoint data can be edited in the DNR Garmin table if desired.

Upload the waypoints in the table to the GPS by selecting **Waypoints>Upload** from the DNR Garmin menu.



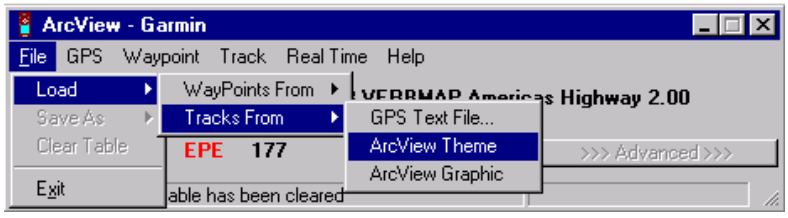
A message box will appear once the download has been completed. Press the **OK** button and continue.



Uploading Tracks

Tracks can be loaded into the GPS from line or polygon shapefiles or graphics in the active view. In order to upload tracks from shapefiles, the shapefile must be the active theme. DNR Garmin will only upload the selected features from the shapefile. If there are no selected features in the active theme, all features will be uploaded. Only selected graphics will be uploaded.

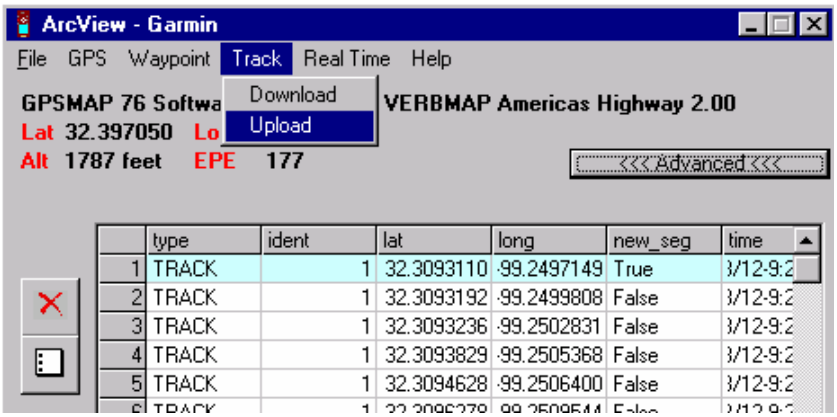
Click on **File>Load Tracks From** and choose **Text File**, **ArcView Theme**, or **ArcView Graphic** to begin uploading track data into the DNR Garmin table.



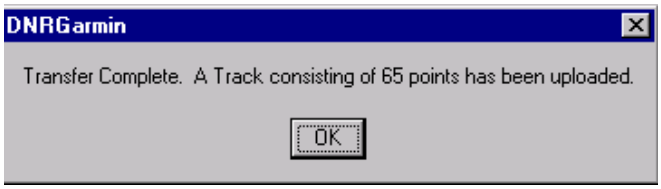
If no features are selected in the active themes that you are uploading, DNR Garmin will display a dialog asking if you want to load all features in the shapefile. Press **Yes**.

The Track data can be edited in the DNR Garmin table if desired.

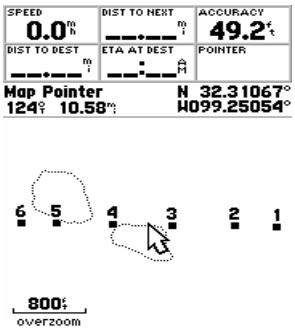
Upload the waypoints in the table to the GPS by selecting **Track>Upload** from the DNR Garmin menu.



A message box will appear once the download has been completed. Press the **OK** button and continue.



The data has been loaded to the GPS and is ready to go to the field.



Appendix A - Official NRCS Policy in South Dakota for Using GPS to Certify Conservation Practices

1. Procedures

(a) Background.
Field tests with differential (with beacon signal) Global Positioning Systems (DGPS) have shown that the level of accuracy of these systems is as good or better than our current methods of measurements. DGPS units properly used by trained personnel can meet current NRCS spot checking tolerances for practice certification.

(b) Area Measurements.
DGPS can be used to measure any area for practice certification provided the accuracy level calculated by the Garmin GPSMap 76 unit is 12 feet or less.

(c) Length Measurements.
DGPS can be used to measure any length for practice certification on slopes less than 15 percent provided the accuracy level calculated by the Garmin GPSMap 76 unit is 12 feet or less. If slopes exceed 15 percent for a portion of the measurement, the steeper slope lengths must be measured by conventional methods, such as tapes or measuring wheels.

(d) Verification of DGPS data for practice certification.
All area and length measurements obtained DGPS units for practice certification must be downloaded into ArcView/Customer Toolkit for verification of the proper location of the conservation practice. DGPS data (position points) used for practice certification will be stored in a Customer folder in ArcView/Customer Service Toolkit for that cooperator. When ArcView/Customer Service Toolkit and DGPS equipment is used to certify a conservation practice, the Conservation Practice Certification Template (ArcView Layout) shall be used to document certification of all conservation practices.

(e) Use of Digital Orthophotography for practice certification.
Areas that are very WELL-DEFINED (visually) on Digital Orthophotography can be digitized and measured using ArcView/Customer Service Toolkit for practice certification. The view scale in ArcView shall be 1:7920 (1 inch = 660 feet) or less.

(f) DGPS Practice Certification
Only those employees that have received DGPS training will be allowed to use ArcView/Customer Service Toolkit and DGPS equipment to certify a conservation practice.

(g) Approved GPS Platform.
The state conservationist will approve GPS platforms (hardware and software) that are acceptable for practice certification.

(h) South Dakota NRCS GPS User Guide.
A South Dakota NRCS User Guide (Technology Technical Note No. 1) has been developed for each GPS platform approved by the state conservationist.

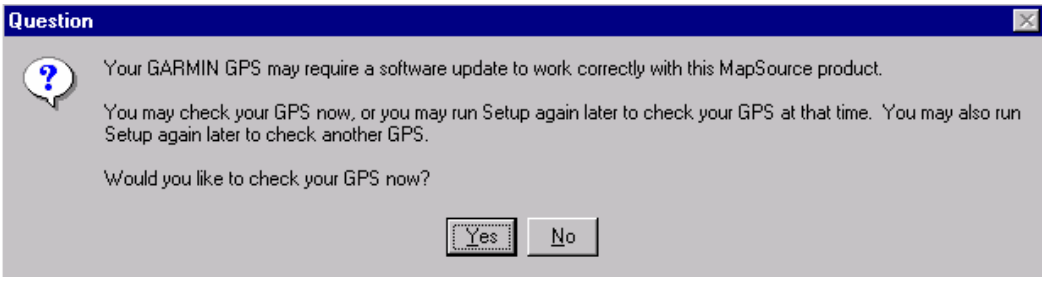
All GPS users shall follow the procedures outlined in the South Dakota NRCS User Guide (Technology Technical Note No. 1) developed for that platform to insure proper data collection and practice certification.

Please see General Manual 450, Part 407, Subpart D, dated March 2004, for official NRCS policy.

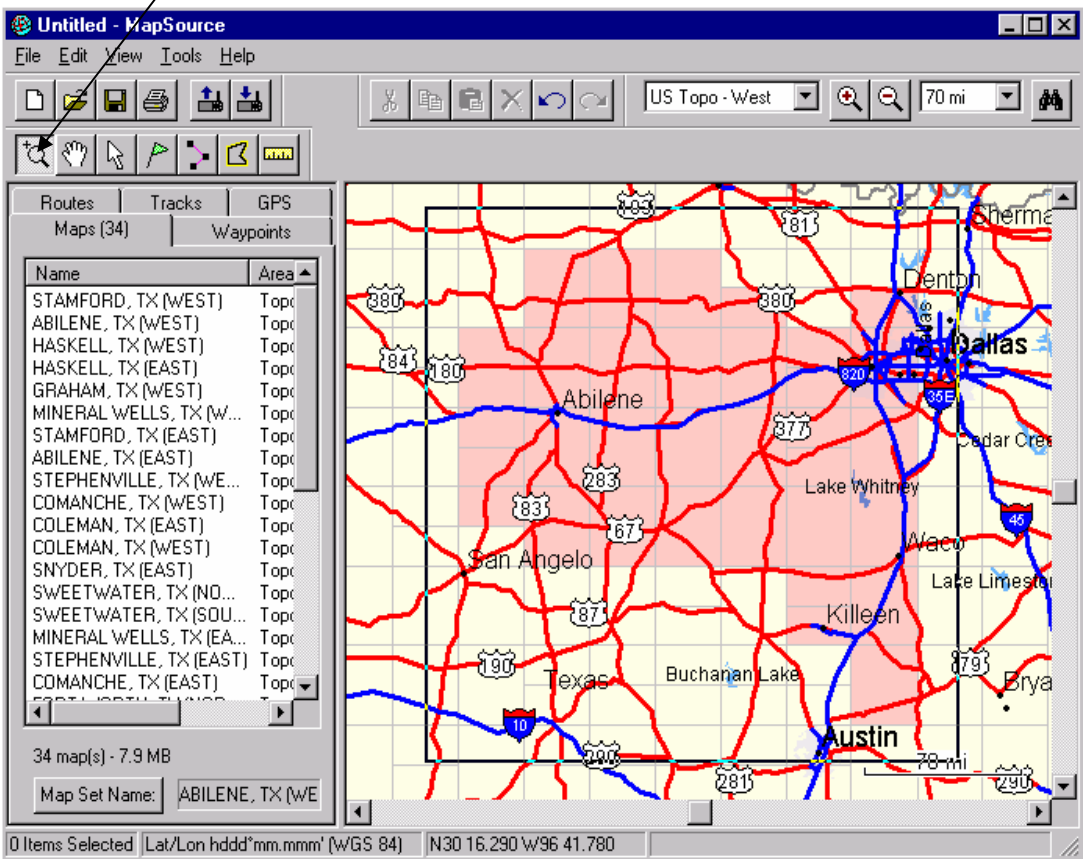
Appendix B: Using MapSource to Load Background Maps

MapSource maps may be uploaded, if desired. An IT Administrator will be needed to install MapSource (if not already installed).

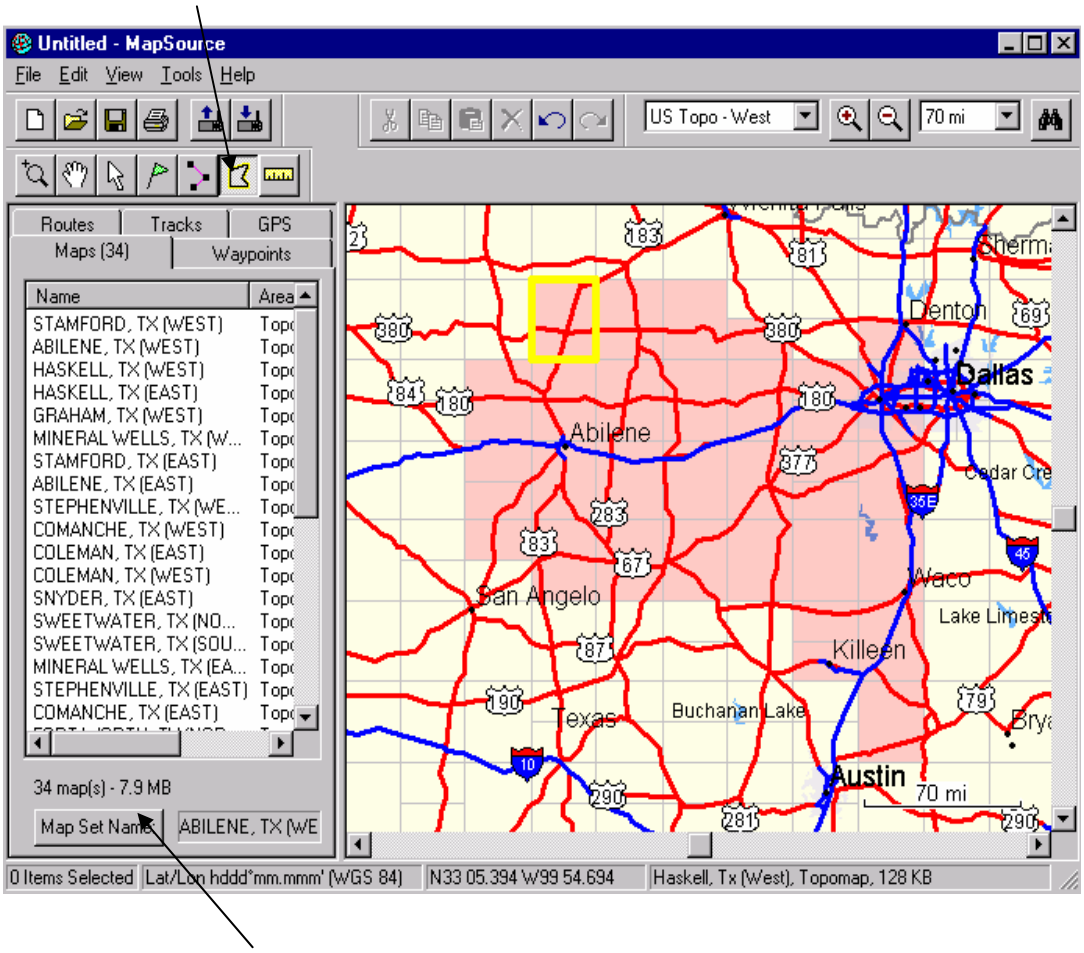
When installing Mapsource, the setup program will ask to check your GPS for the latest firmware. Select **No** and continue with the installation of Mapsource.



Login as a regular User.
Insert the Western US CD (Disk 1 of 3) of MapSource TOPO into the computer.
Start MapSource program.
Use the **Zoom Tool** to draw a box around the area to load the detailed maps from.

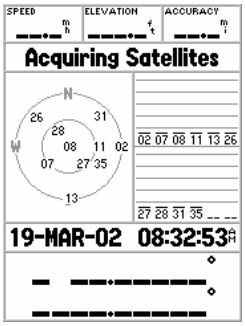


Use the **Map Tool** to click on sections of the map to load into the GPSmap 76. When an area is selected by clicking on a “block” of maps the area is outlined in yellow and the area that will be loaded becomes shaded. The name of Map block is listed under the Maps tab.



The GPSMap 76 can hold 8mb of map data, which are approximately 30-35 maps.

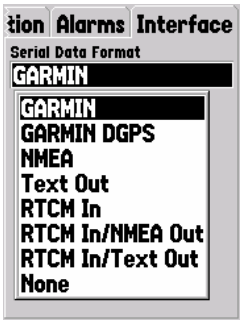
Connect the GPSmap 76 to the computer.
Turn on the GPSmap 76 (red button).
Press the **Enter** button (2 to 3 times) until you see the GPS Information Page.



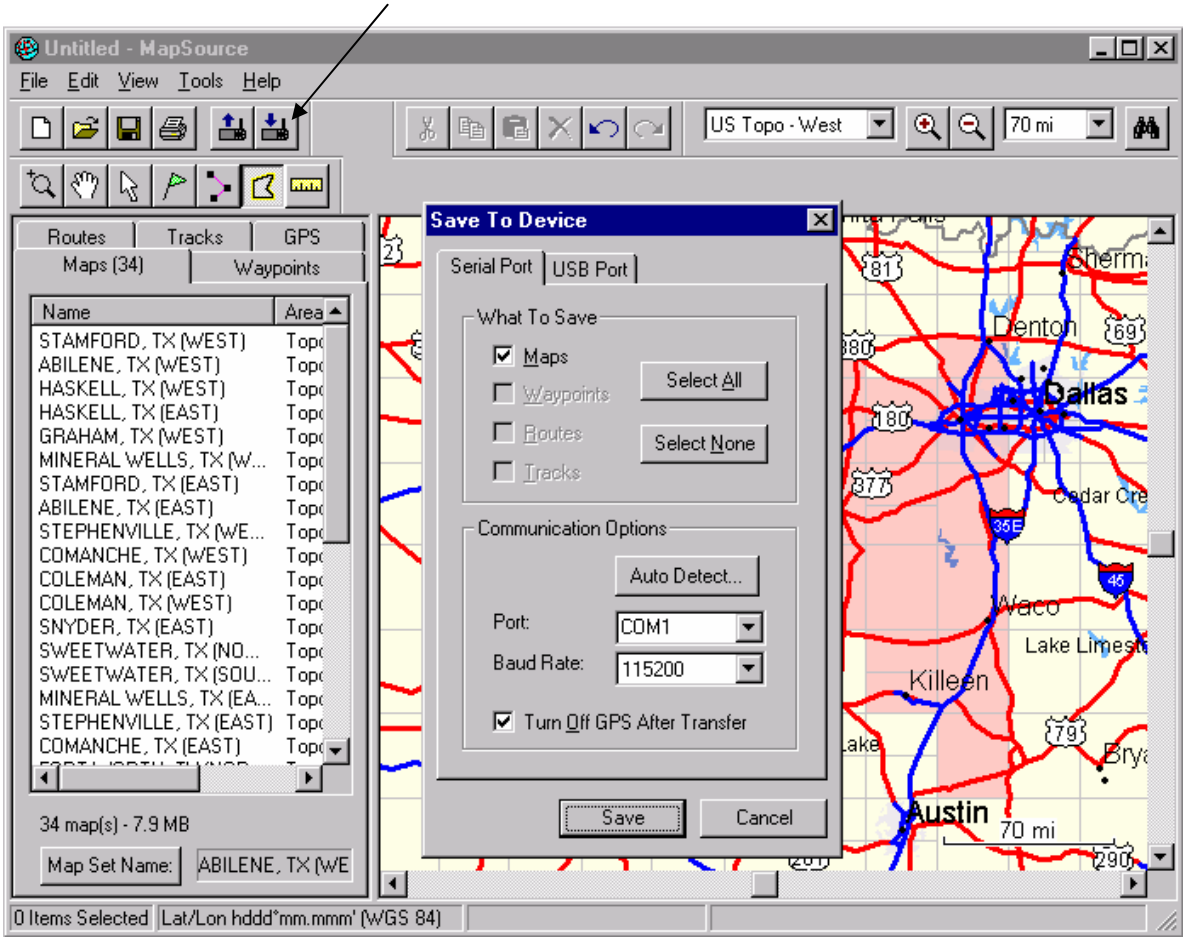
Press **Menu** button once. **Start Simulator** is highlighted. Press **Enter** button.

Verify the **GARMIN** interface is selected:

- Press **Menu** button two times.
- Toggle (rocker button) up or down to select the **Setup** menu and press **Enter** button.
- Toggle (rocker button) left or right to select the Interface menu. Verify **Serial Data Format** is set to **GARMIN**. If not, toggle down and change the setting.



In MapSource, click the **Save to GPS** button.



A pop-up window will appear with Maps checked. Click the **Save** button.

After transfer is complete, **Exit** MapSource.

Appendix C- Example of a GPS Data Collection Worksheet

USDA NRCS
Natural Resources Conservation Service

GPS DATA COLLECTION WORKSHEET

NAME: ______________________________ DATE: __________

PROGRAM: __________ PRACTICE: __________ LEGAL: ______________

TRACT #: __________ FIELD NO.(s): __________ ASSISTED BY: ______________

WEATHER CONDITIONS: ____

PROJECT DESCRIPTION: ____

TRACK OR WAYPOINT	TIME	ACCURACY	COMMENTS

Appendix D – Step by Step Guide For Garmin Use

Garmin GPS

1. Push light key to turn on. **(You might have to hold down 1-2 seconds)**
2. Press enter once
3. Press page twice
4. Press page once to use the map screen page

Setting Up the Garmin Unit

1. Turn on the Garmin as above
2. Press the menu key twice
3. Rocker over to location tab
4. Rocker down to location format, press enter
5. Rocker up or down to the data format you want to use
6. (UTM UPS, hddd.ddddd, ddd mm.mmmm)
7. Press enter to select
8. Rocker down to map datum and press enter
9. Rocker up or down to NAD83 and press enter
10. Press page key twice to return to map screen

To setup the page lay on the map screen

1. Press menu once and rocker down to setup page layout
2. Press enter once and choose the number of lines to display (normally small (2 Rows)
3. Press menu once and rocker down to change data fields
4. Press enter once, use the rocker key to move between cells, press enter to change the data field, using the rocker key move up or down to the field you want to display
5. Useful fields are speed, elevation, time of day, accuracy, track and course

(If only using hand-held choose Garmin)

1. Turn on
2. Hit menu twice
3. Arrow down to set-up, press enter
4. Arrow over to interface
5. Arrow down to serial data format, press enter
6. Chose Garmin, press enter
7. Press page to return to GPS

Using GPS in the field With Backpack

1. Hook up gray cables
2. Turn on
3. Hit menu twice
4. Arrow down to set-up, press enter
5. Arrow over to interface
6. Arrow down to serial data format, press enter
7. Chose RTCM In/NMEAout, press enter
8. Arrow down to Beacon
9. Arrow over to frequency, press enter, for Clark Tower Follow Steps 10-13
10. Using rocker keys, change number to 309, press enter
11. Arrow over to BitRate, press enter
12. Using rocker key, choose 100, press enter
13. Hit page button to return to GPS screen
14. Arrow over to frequency, press enter, for Omaha Tower Follow Steps 15-18

15. Using rocker keys, change number to 298, press enter
16. Arrow over to BitRate, press enter
17. Using rocker key, choose 200, press enter
18. Hit page button to return to GPS screen
19. Arrow over to frequency, press enter For Medora, ND Tower Follow Steps 20-23
20. Using rocker keys, change number to 325, press enter
21. Arrow over to BitRate, press enter
22. Using rocker key, choose 100, press enter
23. Hit page button to return to GPS screen
24. Arrow over to frequency, press enter For Whitney Tower Follow Steps 25-28
25. Using rocker keys, change number to 310, press enter
26. Arrow over to BitRate, press enter
27. Using rocker key, choose 200, press enter
28. Hit page button to return to GPS screen

Storing Waypoints

1. Press and hold down the enter/mark key
2. Press enter to save

To align points,

1. Press Menu key twice
2. Rocker to Points, Press enter
3. Rocker to Waypoints, Press enter
4. Rocker to point you want to align with and press enter
5. Note location of waypoint, press page to exit and return to GPS screen

To determine distance from one point to another

Method One For length Distances

1. Press menu key twice
2. Rocker to trip computer
3. Press enter key
4. Press menu key
5. Rocker to reset trip
6. Press enter key
7. Press page key to return to GPS screen
8. Travel from first point to next point
9. Repeat steps 1-3

Method Two Shows Distance on Screen

1. On the GPS screen press menu key once
2. Rocker to measure distance
3. Press enter
4. Distance bar shows on GPS Screen
5. Using rocker key place arrow on point you want to determine distance from and began traveling to next point
6. Press menu key once
7. Rocker to stop measuring, Press enter

Method Three Point to Point Distances

1. Press menu key twice
2. Rocker to routes

3. Press enter key
4. Press enter key
5. Name your route if you wish to by pressing enter key
6. Rocker key to line under waypoint on screen
7. Press enter key
8. Rocker to waypoints
9. Press enter key
10. Rocker to point you want to measure from
11. Press enter
12. Rocker to ok, press enter key
13. Rocker key to next line
14. Repeat steps 7-12
15. If you wish you can measure individual segments of a route by entering the waypoints into route in the correct order.

Turn tracking on

1. Press menu key twice
2. Arrow down to Tracks, press enter
3. Press menu
4. Arrow down to Set-up Track log, press enter
5. Arrow up to Recording, press enter
6. Chose Stop When Full, press enter
7. Arrow down to Okay, press enter **(Remember the time you started tracking)**
8. Press Quit twice to return to GPS screen

Start and Stop Tracking

1. Press menu key twice
2. Arrow down to Tracks, press enter
3. Press menu
4. Arrow down to Set-up Track log, press enter
5. Arrow up to Recording, press enter
6. Chose Stop When Full or Wrap When Full, press enter
7. Arrow down to Okay, press enter **(Remember the time you started tracking)**
8. Press Quit twice to return to GPS screen
9. Track (by walking or driving to obstacle)
10. Press menu key twice
11. Arrow down to Tracks, press enter
12. Press menu
13. Arrow down to Set-up Track log, press enter
14. Arrow up to Recording, press enter
15. Chose Stop When Full or Wrap When Full, press enter
16. Arrow down to Okay, press enter
17. Go around obstacle, get as close as possible to obstacle
18. Press menu key twice
19. Arrow down to Tracks, press enter
20. Press menu
21. Arrow down to Set-up Track log, press enter
22. Arrow up to Recording, press enter
23. Chose Stop When Full or Wrap When Full, press enter
24. Arrow down to Okay, press enter
25. Press Quit twice to return to GPS screen
26. Finish by walking or driving to end of track.

Once tracking is complete

1. Press menu key twice
2. Arrow down to Tracks, press enter
3. Press menu
4. Arrow down to Set-up Track log, press enter
5. Arrow up to Recording, press enter
6. Chose Off
7. Arrow down to Okay, press enter
8. On save, press enter
9. Chose starting time of track, press enter

To look at acres or distance of a track or to map

1. Press Menu twice
2. Rocker to tracks, press enter
3. Rocker to track you want to look at, press enter. This will show data screen.
4. Rocker to map and press enter to map on screen
5. Press page to return to GPS screen

Using ArcView and GPS

Load into computer

(Hit menu and select Start Simulator, this will save on the batteries)

1. Hook up black download cable
2. Hit menu twice
3. Arrow down to set-up, press enter
4. Arrow over to interface
5. Arrow down to serial data format, press enter
6. Chose Garmin, press enter
7. Press quit to return to GPS screen

Open customer in Toolkit

1. Open customer folder tab
2. ArcView projects (Toolkit template), Select New View
3. Click on DNR Garmin
4. Click set projections (UTM-1983 Zone 14), Categories = UTM1983, Zone=114
5. Click on DNR Garmin
6. Open Garmin, DNR Screen Pops up (this will show software version)
7. Click Waypoint or Track (which one you want to download)
8. Click Advanced
9. Remove ones you don't want by selecting them (use shift or ctrl and mouse click), Click on RED X to remove
10. Click file
11. Click Save as: ArcView Shapefile (should be saved in ArcView Folder in Toolkit customer folder) C:\customer files\customer name\engineering\
12. With tracks – software will ask if you want point, line, or polygon, chose 1, press enter
13. To Calculate acres of polygon themes: Highlight tracks theme, click theme, start editing, click theme stop editing, save edits (yes)

NOTE: When doing tracks, saved tracks will have less points than the active log